FINAL REPORT OF RESEARCH

RANDOMIZATION PROCEDURES AND FACTORIAL EXPERIMENTS

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The problem of estimating a set of pre-assigned parameters by a randomly chosen fractional replicate of a full factorial system, previously studied by Ehrenfeld and Zacks [4], was studied further in terms of decision theory. In this context the experimenter chooses a strategy which consists of a randomization procedure combined with an estimator. The class of randomization procedures considered include, as special cases, the classical fixed fractional factorial experiments as well as those studied in [4]. This forms a fruitful framework for studying the relative merits of randomization. A preference relation between procedures is defined in terms of minimax risk for two loss functions: mean-square-error and closeness. Minimax strategies, for various states of information concerning nuisance parameters are derived. It is shown, for example, that when all the signs of the nuisance parameters are known, randomization procedure I, studied in [4], is optimal. When all the signs are known, there exists a fixed fractional factorial experiment, combined with a suitable adjusted estimator, which is optimal. These and other related results are given in papers [1], [2], and [3], previously sent to you on October 18, 1962 and March 4, 1963. These papers have been submitted for publication.

Other work in this area which is being pursued involves the comparison of different experiments for estimating parameters in birth and death

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stochastic processes with particular application to queueing problems. The various experiments being compared involve the length of observation time and the kinds of observations which should be taken.

The principal investigator on this grant is Dr. Sylvain Ehrenfeld. Others who have worked on this research grant are Irwin Greenberg and Shelemeyahu Zacks.

References:

[1] "Comparison of Randomized and Non-Randomized Factorial Experiments"

[2] "Minimax Closeness Strategies and the Comparison of Randomized and Non-Randomized Factorial Experiments"

[3] "On Fractional Factorial Experiments"

[4] "Randomization and Factorial Experiments," Annals of Mathematical Statistics, March 1961.